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(12) **United States Patent**
Rebert

(10) **Patent No.: US 10,979,595 B2**
(45) **Date of Patent: *Apr. 13, 2021**

(54) **SYSTEM AND METHOD FOR SELECTIVELY SENDING, DELIVERY AND RECEIVING OF FAXES**

(71) Applicant: **OPEN TEXT SA ULC**, Halifax (CA)

(72) Inventor: **Treber Rebert**, Tucson, AZ (US)

(73) Assignee: **OPEN TEXT SA ULC**, Halifax (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/840,605**

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US 2020/0236246 A1 Jul. 23, 2020

Related U.S. Application Data

(63) Continuation of application No. 15/860,220, filed on Jan. 2, 2018, now Pat. No. 10,652,425, which is a (Continued)

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H04N 1/32 (2006.01)
H04N 1/00 (2006.01)
H04N 1/21 (2006.01)

(52) **U.S. Cl.**
CPC ..... ***H04N 1/32619*** (2013.01); ***H04N 1/001*** (2013.01); ***H04N 1/0001*** (2013.01); (Continued)

(58) **Field of Classification Search**
CPC ..... H04N 1/32619; H04N 1/0001; H04N 1/00037; H04N 1/0005; H04N 1/00082; (Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,461,488 A 10/1995 Witek
5,644,404 A 7/1997 Hashimoto et al.
(Continued)

FOREIGN PATENT DOCUMENTS

JP 2003319128 11/2003
WO WO0160050 8/2001
(Continued)

OTHER PUBLICATIONS

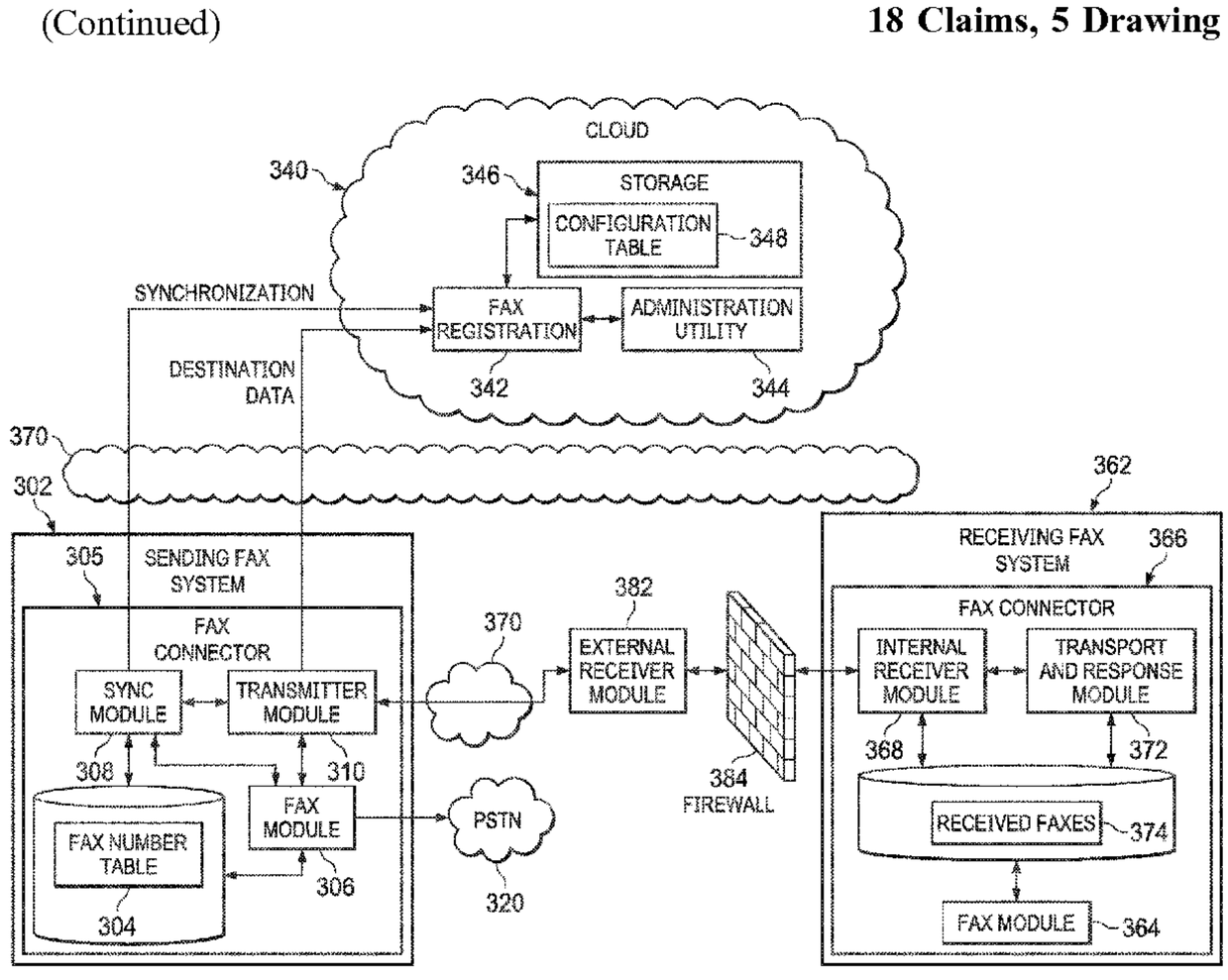
Office Action issued for U.S. Appl. No. 13/315,978, dated Dec. 16, 2013, 14 pages.
(Continued)

Primary Examiner — Neil R McLean
(74) *Attorney, Agent, or Firm* — Sprinkle IP Law Group

(57) **ABSTRACT**

Embodiment of systems and methods for the sending, delivery or receiving of faxes are disclosed herein. In particular, certain embodiments include a fax connector that may be deployed at users' sites, and a fax registration system that may be deployed remotely from these users' site. The fax connector can be accessed at a user's site over a computer based network in order to perform functions associated with faxing, including sending, receiving and obtaining status on faxes. The fax connector deployed at a sending user's site communicates with the fax registration system to obtain destination data associated with a recipient user's fax connector and transmits the fax to the destination fax connector over the computer based network based on the destination data obtained from the registration system. The fax can then be presented to the recipient at the recipient user's site.

18 Claims, 5 Drawing Sheets



Related U.S. Application Data

continuation of application No. 14/612,969, filed on Feb. 3, 2015, now Pat. No. 9,912,833, which is a continuation of application No. 13/485,140, filed on May 31, 2012, now Pat. No. 8,995,025.

(60) Provisional application No. 61/501,549, filed on Jun. 27, 2011.

(52) **U.S. Cl.**
CPC ***H04N 1/0005*** (2013.01); ***H04N 1/00037*** (2013.01); ***H04N 1/00082*** (2013.01); ***H04N 1/00217*** (2013.01); ***H04N 1/2183*** (2013.01); ***H04N 1/32411*** (2013.01); ***H04N 1/32416*** (2013.01); ***H04N 1/32614*** (2013.01); ***H04N 1/32683*** (2013.01); *H04N 2201/0039* (2013.01); *H04N 2201/0049* (2013.01); *H04N 2201/0093* (2013.01); *H04N 2201/3288* (2013.01)

(58) **Field of Classification Search**
CPC .. H04N 1/001; H04N 1/2183; H04N 1/00217; H04N 1/32411; H04N 1/32416; H04N 1/32614; H04N 1/32683; H04N 2201/0039; H04N 2201/0049; H04N 2201/0093; H04N 2201/3288
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,754,640	A	5/1998	Sosnowski	
5,761,284	A	6/1998	Ranalli et al.	
5,780,549	A	7/1998	Ludwig	
5,862,202	A	1/1999	Bashoura et al.	
5,999,601	A	12/1999	Wells et al.	
6,020,980	A	2/2000	Freeman	
6,058,169	A	5/2000	Bramnick et al.	
6,259,538	B1	7/2001	Amit et al.	
6,301,611	B1	10/2001	Matsumoto et al.	
6,310,942	B1	10/2001	Bashoura et al.	
6,512,593	B1	1/2003	Yashiki	
6,539,077	B1	3/2003	Ranalli et al.	
6,603,569	B1	8/2003	Johnson, Jr. et al.	
6,618,165	B1	9/2003	Sehgal	
6,825,947	B1	11/2004	Asai	
6,922,255	B1	7/2005	Tomida	
7,057,752	B1	6/2006	Klotz, Jr.	
7,324,223	B1	1/2008	Mori	
7,480,065	B1	1/2009	Trandal et al.	
7,492,473	B2	2/2009	Ferlitsch et al.	
7,653,185	B2	1/2010	Rebert et al.	
8,249,228	B2	8/2012	Street, Jr.	
8,279,465	B2	10/2012	Couchman	
8,310,710	B2	11/2012	Phillips et al.	
8,493,606	B2	7/2013	Phillips et al.	
8,937,736	B2	1/2015	Rebert et al.	
8,970,880	B2	3/2015	Riedel et al.	
8,970,881	B1	3/2015	Schwarz	
8,995,025	B2	3/2015	Rebert	
9,544,469	B2	1/2017	Rebert et al.	
9,699,127	B2	7/2017	Lennstrom et al.	
9,912,833	B2	3/2018	Rebert	
9,948,826	B2	4/2018	Riedel et al.	
10,097,728	B2	10/2018	Rebert et al.	
10,175,919	B2	1/2019	Schwarz	
10,289,354	B2	5/2019	Schwarz	
10,348,930	B2	7/2019	Riedel et al.	
10,397,155	B2	8/2019	Lennstrom et al.	
10,440,228	B2	10/2019	Rebert et al.	
10,652,425	B2	5/2020	Rebert et al.	
10,728,421	B2	7/2020	Rebert et al.	
10,911,637	B2	2/2021	Rebert et al.	
2001/0005268	A1	6/2001	Eguchi	
2001/0005864	A1	6/2001	Mousseau et al.	
2001/0027478	A1	10/2001	Meier et al.	
2001/0056538	A1	12/2001	Amano	
2002/0018245	A1	2/2002	Saito et al.	
2002/0021791	A1	2/2002	Heilmann et al.	
2002/0026498	A1	2/2002	Kim	
2002/0033961	A1	3/2002	Murphy	
2002/0051146	A1	5/2002	Tanimoto	
2002/0054371	A1	5/2002	Tanimoto	
2002/0073181	A1	6/2002	Christensen	
2002/0157028	A1	10/2002	Koue et al.	
2003/0053444	A1	3/2003	Swartz	
2003/0086124	A1	5/2003	Parry	
2003/0133550	A1	7/2003	Mazor et al.	
2003/0142801	A1	7/2003	Pecht	
2004/0004733	A1	1/2004	Berker et al.	
2004/0039797	A1	2/2004	Simpson et al.	
2004/0136513	A1	7/2004	Chiu	
2004/0218226	A1	11/2004	Antognini et al.	
2005/0086240	A1	4/2005	Richardson et al.	
2005/0086306	A1	4/2005	Lemke	
2005/0094176	A1	5/2005	Matsuishi	
2005/0108323	A1	5/2005	Taylor et al.	
2005/0162706	A1	7/2005	Eguchi et al.	
2005/0168774	A1	8/2005	Eguchi et al.	
2005/0190402	A1	9/2005	Nakamura	
2005/0270558	A1*	12/2005	Konsella	H04N 1/00209 358/1.15
2005/0275871	A1*	12/2005	Baird	H04N 1/32411 358/1.15
2006/0227367	A1	10/2006	Kitada	
2006/0238822	A1	10/2006	Van Hoof	
2007/0130271	A1	6/2007	Ye et al.	
2007/0130365	A1*	6/2007	Rebert	H04L 67/12 709/238
2007/0146802	A1	6/2007	Ushida	
2007/0150242	A1	6/2007	Kitada et al.	
2007/0168557	A1	7/2007	Henry	
2007/0297002	A1	12/2007	Hase et al.	
2008/0019519	A1	1/2008	Su et al.	
2008/0065477	A1	3/2008	Korhonen	
2008/0155108	A1	6/2008	Morris	
2008/0218809	A1	9/2008	Chen et al.	
2008/0252922	A1	10/2008	Ikegami et al.	
2008/0273220	A1	11/2008	Couchman	
2009/0034015	A1	2/2009	Mulligan et al.	
2009/0067414	A1	3/2009	Toscano et al.	
2009/0073499	A1	3/2009	Glunz	
2009/0088191	A1	4/2009	Norton et al.	
2009/0161168	A1	6/2009	Miyamoto	
2009/0190159	A1	7/2009	Toscano et al.	
2009/0222663	A1	9/2009	Chow et al.	
2009/0244617	A1	10/2009	Matsutani	
2009/0316182	A1	12/2009	Lee	
2009/0316203	A1	12/2009	Dukie et al.	
2009/0323100	A1	12/2009	Lee	
2010/0002260	A1	1/2010	Naylor et al.	
2010/0007917	A1	1/2010	Webster et al.	
2010/0039678	A1	2/2010	Noel et al.	
2010/0067063	A1	3/2010	Jang	
2010/0075673	A1	3/2010	Colbert et al.	
2010/0085609	A1	4/2010	Hong	
2010/0182651	A1	7/2010	Rebert et al.	
2010/0097634	A1	8/2010	Meyers et al.	
2010/0208726	A1	8/2010	Oliszewski et al.	
2010/0281016	A1	11/2010	Weissman et al.	
2010/0296121	A1	11/2010	Shaheen, III et al.	
2011/0110366	A1	5/2011	Moore et al.	
2011/0211218	A1	9/2011	Gilmore et al.	
2011/0274258	A1	11/2011	Casalaina et al.	
2012/0143658	A1	6/2012	Toscano et al.	
2012/0147436	A1*	6/2012	Nishiyama	H04N 1/32096 358/406
2012/0257249	A1	10/2012	Natarajan	
2012/0274988	A1	11/2012	Bloomfield	
2012/0297471	A1	11/2012	Smithson	
2013/0088741	A1	4/2013	Murata et al.	
2013/0091042	A1	4/2013	Shah et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2013/0287189	A1	10/2013	Cichielo et al.
2013/0293933	A1	11/2013	Rebert et al.
2013/0346522	A1	12/2013	Lennstrom et al.
2014/0204411	A1	7/2014	Riedel et al.
2014/0307294	A1	10/2014	Rebert
2014/0340717	A1	11/2014	Meiyappan
2015/0085324	A1	3/2015	Rebert et al.
2015/0138601	A1	5/2015	Riedel et al.
2015/0146256	A1	5/2015	Schwarz
2015/0181075	A1	6/2015	Rebert
2017/0070618	A1	3/2017	Rebert et al.
2017/0264580	A1	9/2017	Lennstrom et al.
2018/0020121	A1	1/2018	Riedel et al.
2018/0146112	A1	5/2018	Rebert et al.
2018/0309904	A1	10/2018	Rebert et al.
2019/0018626	A1	1/2019	Schwarz
2019/0394358	A1	12/2019	Rebert et al.

FOREIGN PATENT DOCUMENTS

WO	WO01060050	8/2001
WO	WO03061270	7/2003

OTHER PUBLICATIONS

Schneider, Introduction to Multi-Tenant Architecture, Developer.com, Feb. 11, 2009, retrieved on Dec. 8, 2010, from <<http:www.developer.com/design/article.php/3801931>>, 4 pages.

Multi-tenant Architecture, Zscaler Cloud Security, 2009-2010, retrieved on Dec. 8, 2010, from <<http://www.zscaler.com/multi-tenant.html>>, 2 pages.

Chong et al., Architecture Strategies for Catching the Long Tail, Microsoft Corporation, Apr. 2006, retrieved on Dec. 8, 2010, from <<http://msdn.microsoft.com/en-us/library/aa479069(printer).aspx>>, 20 pages.

Cloud-based Networking—Why Multi-tenancy Matters, White Paper, Pareto Networks, 2010, 14 pages.

Partial Search Report issued for European Patent Application No. 13 173 845.2, dated Nov. 14, 2013, 5 pages.

Extended Search Report issued for European Patent Application No. 13 173 845.2, dated Mar. 4, 2014, 9 pages.

International Search Report and Written Opinion issued for PCT Application No. PCT/EP2013/059026, completed on Jun. 21, 2013 and dated Jul. 2, 2013, 10 pages.

Office Action issued in U.S. Appl. No. 13/485,140, dated Feb. 24, 2014, 14 pages.

Final Office Action issued for U.S. Appl. No. 13/485,140, dated Aug. 7, 2014, 18 pages.

International Preliminary Report on Patentability (IPRP) issued for PCT Application No. PCT/EP2013/059026, dated Nov. 13, 2014, 7 pages.

Office Action issued for U.S. Appl. No. 14/606,519, dated Mar. 9, 2015, 15 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Mar. 11, 2015, 11 pages.

Office Action issued for U.S. Appl. No. 14/556,958, dated Mar. 30, 2015, 8 pages.

Office Action issued for U.S. Appl. No. 13/927,023, dated Apr. 7, 2015, 16 pages.

Office Action issued for U.S. Appl. No. 14/606,519, dated Sep. 8, 2015, 14 pages.

Office Action issued for U.S. Appl. No. 13/927,023, dated Sep. 23, 2015, 20 pages.

Office Action issued for U.S. Appl. No. 14/800,350, dated Sep. 10, 2015, 8 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Oct. 19, 2015, 18 pages.

Final Office Action issued for U.S. Appl. No. 14/606,519, dated Dec. 17, 2015, 14 pages.

Office Action issued for U.S. Appl. No. 13/927,023, dated Feb. 9, 2016, 21 pages.

Office Action issued for U.S. Appl. No. 14/612,969, dated Feb. 29, 2016, 16 pages.

Notice of Allowance issued for U.S. Appl. No. 14/606,523, dated Apr. 8, 2016, 15 pages.

Office Action for U.S. Appl. No. 14/606,519, dated May 3, 2016, 14 pgs.

Notice of Allowance issued for U.S. Appl. No. 14/606,523, dated Jul. 15, 2016, 6 pages.

Office Action issued for U.S. Appl. No. 14/612,969, dated Aug. 2, 2016, 19 pages.

Office Action issued for U.S. Appl. No. 14/606,519, dated Oct. 12, 2016, 15 pages.

Office Action issued for U.S. Appl. No. 14/612,969, dated Feb. 7, 2017, 16 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Feb. 28, 2017, 19 pages.

Office Action issued for U.S. Appl. No. 15/356,078, dated Feb. 24, 2017, 10 pages.

Office Action issued for U.S. Appl. No. 14/612,969, dated May 30, 2017, 15 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Jun. 19, 2017, 25 pages.

Office Action issued for U.S. Appl. No. 15/356,078, dated Jun. 2, 2017, 6 pages.

Office Action issued for U.S. Appl. No. 15/609,843, dated Jul. 12, 2017, 25 pages.

Office Action issued for U.S. Appl. No. 15/356,078, dated Oct. 2, 2017, 6 pages.

Office Action issued for European Patent Application No. 13 173 845.2, dated May 31, 2017, 8 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Nov. 6, 2017, 34 pages.

Office Action issued for U.S. Appl. No. 15/609,843, dated Jan. 9, 2018, 18 pages.

Office Action issued for U.S. Appl. No. 14/606,523, dated Mar. 29, 2018, 40 pages.

Office Action issued for U.S. Appl. No. 15/609,843, dated May 10, 2018, 15 pages.

Summons to Attend Oral Proceedings issued for European Patent Application No. 13173845.2, dated Feb. 5, 2018, 8 pages.

Office Action issued for U.S. Appl. No. 15/609,843, dated Dec. 10, 2018, 17 pages.

Office Action issued for U.S. Appl. No. 15/860,220, dated Apr. 16, 2019, 18 pages.

Office Action issued for U.S. Appl. No. 15/860,220, dated Sep. 4, 2019, 21 pages.

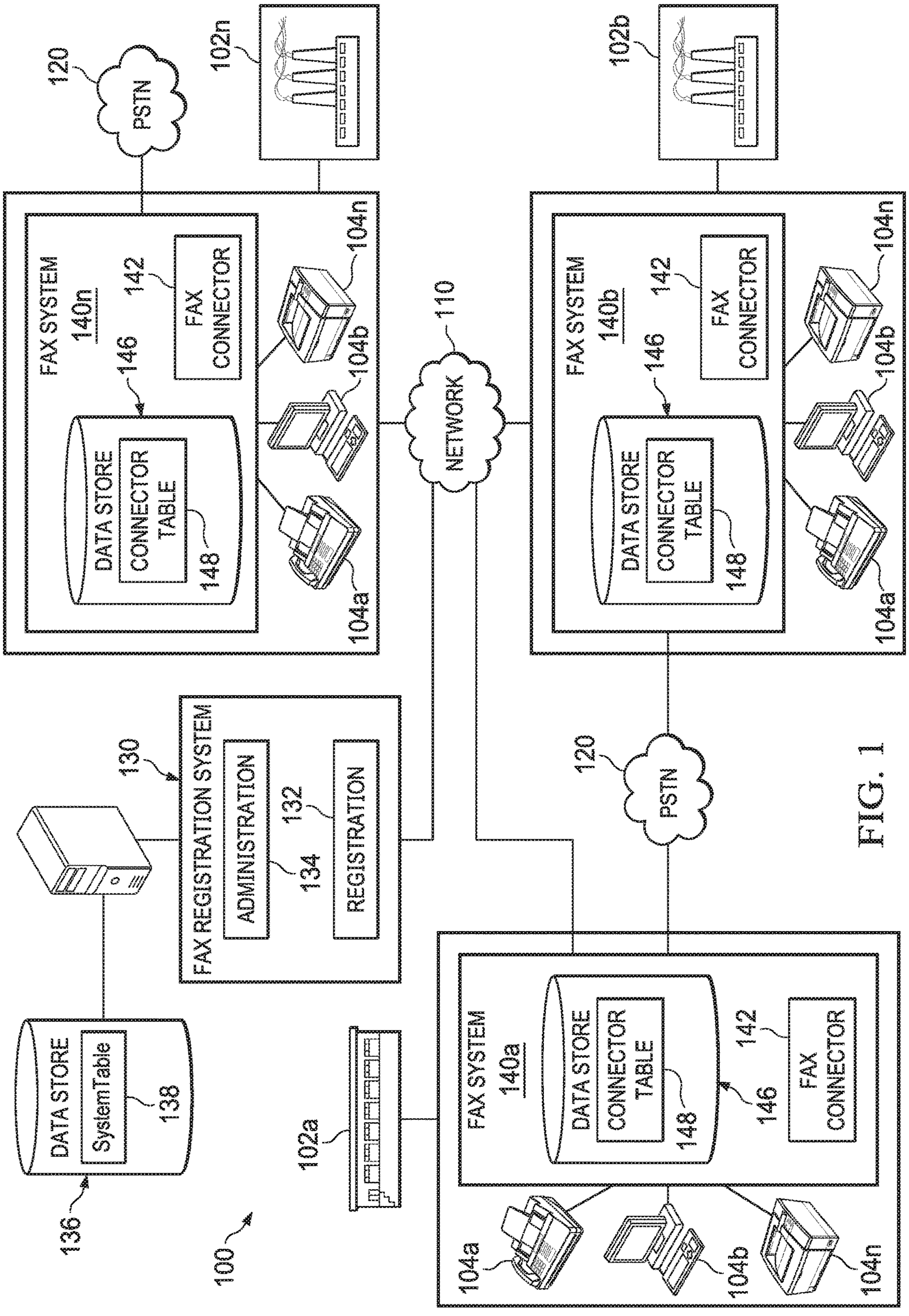
Office Action issued for U.S. Appl No. 16/555,906, dated Oct. 3, 2019, 13 pages.

Notice of Allowance issued for U.S. Appl. No. 15/860,220, dated Jan. 7, 2020, 14 pages.

Notice of Allowance issued for U.S. Appl. No. 16/555,906, dated Mar. 13, 2020, 14 pages.

Notice of Allowance issued for U.S. Appl. No. 16/900,456, dated Sep. 28, 2020, 14 pages.

* cited by examiner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PSTN
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REGISTRATION
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DATA STORE
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140a
140b
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FAX CONNECTOR
DATA STORE
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102n
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104b
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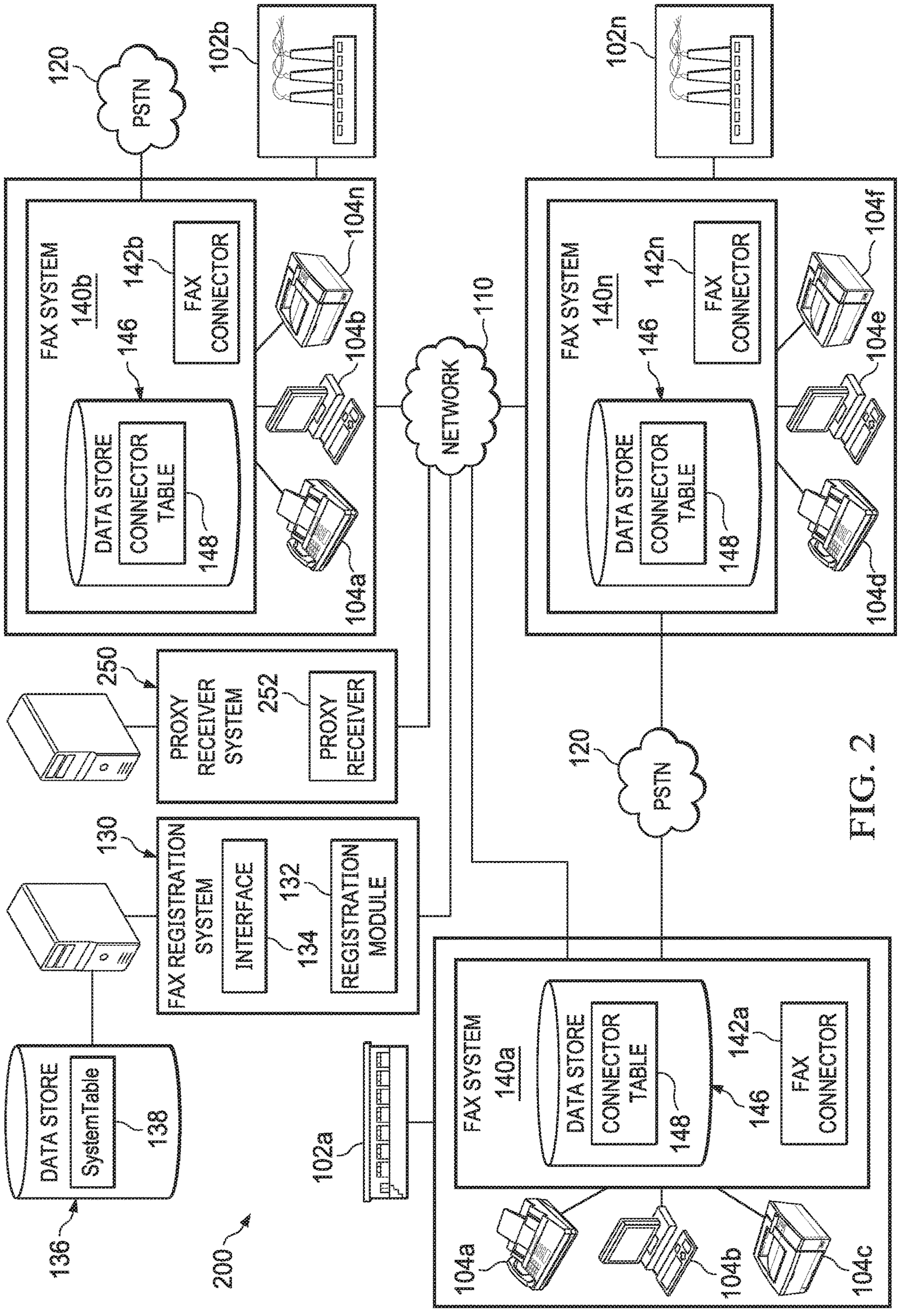
FIG. 1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104d
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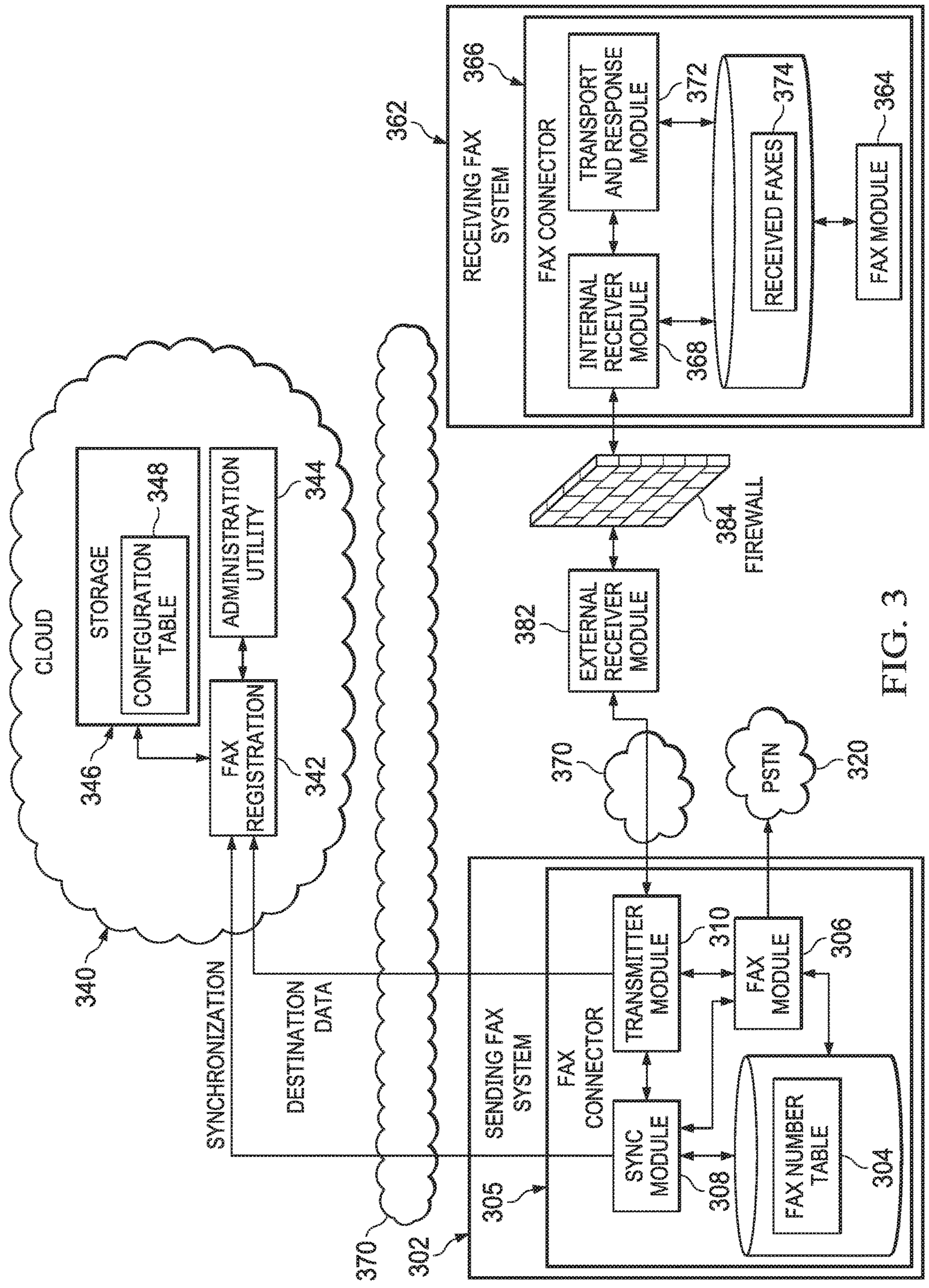
FIG. 2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TRANSMITTER MODULE
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FAX MODULE
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FAX NUMBER TABLE
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FIREWALL
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RECEIVING FAX SYSTEM
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FAX MODULE
364

FIG. 3

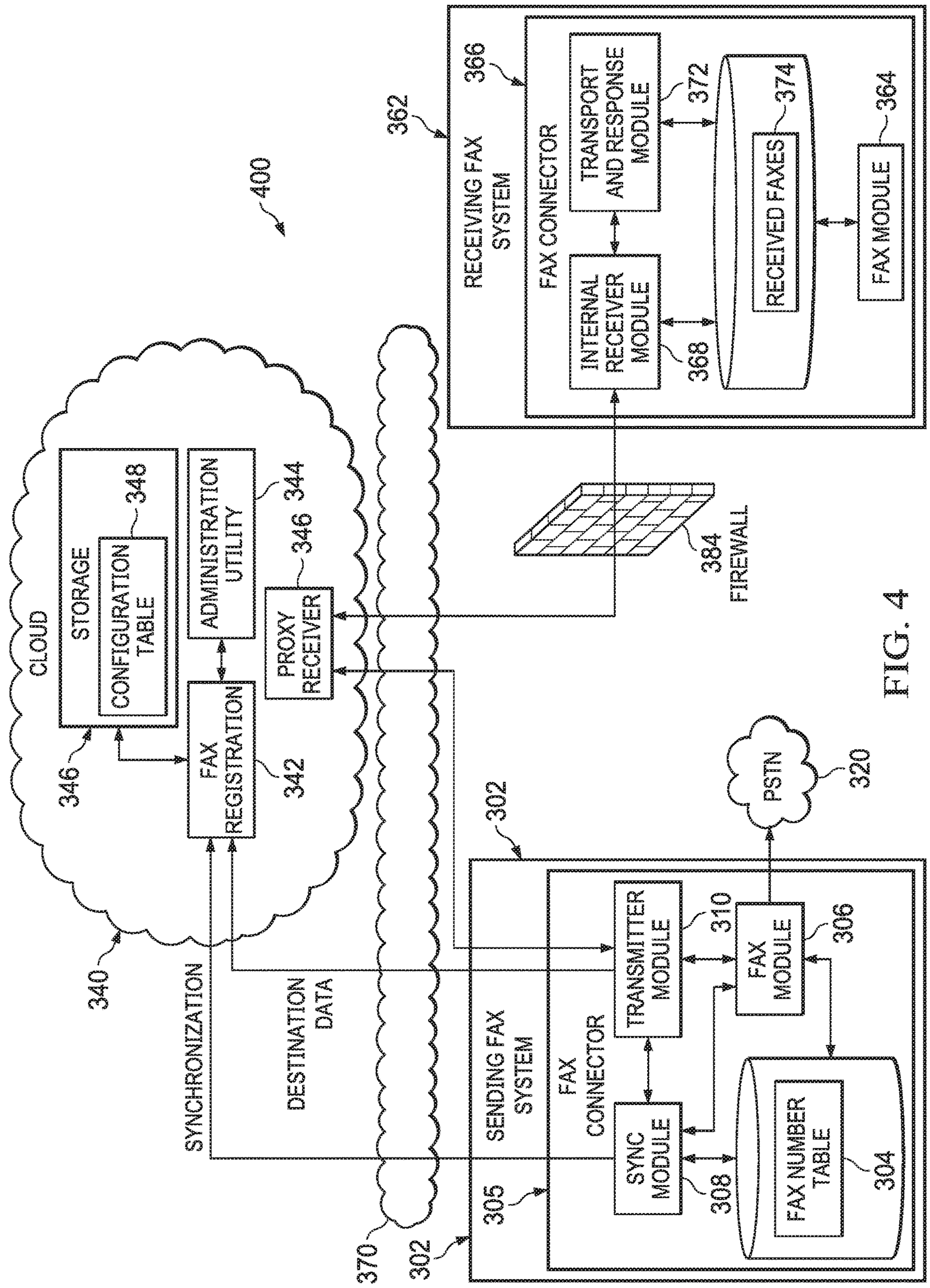
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FIG. 4

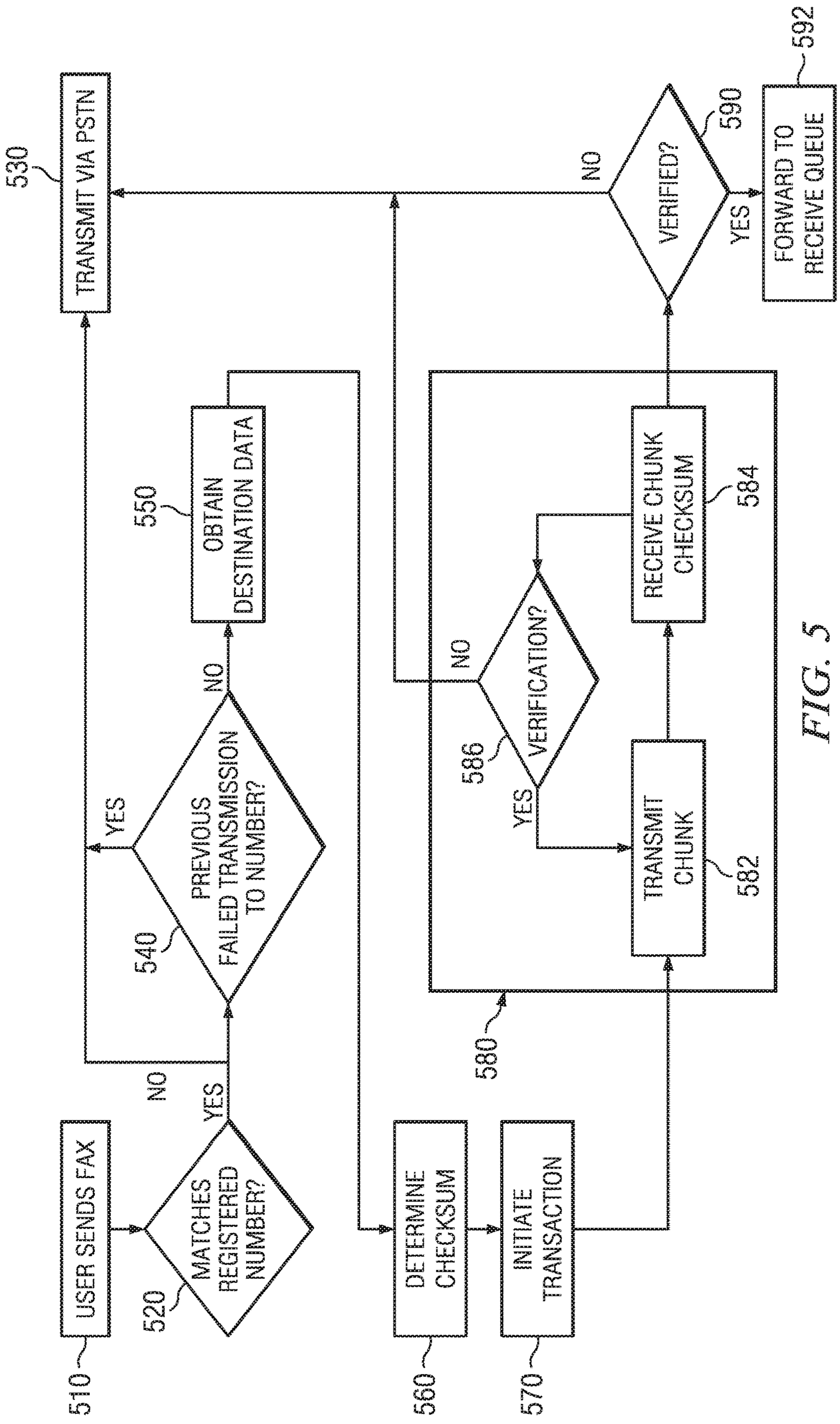
USER SENDS FAX
510
MATCHES REGISTERED NUMBER?
520
NO
YES
PREVIOUS FAILED TRANSMISSION TO NUMBER?
540
NO
YES
OBTAIN DESTINATION DATA
550
TRANSMIT VIA PSTN
530
DETERMINE CHECKSUM
560
INITIATE TRANSACTION
570
TRANSMIT CHUNK
582
RECEIVE CHUNK CHECKSUM
584
VERIFICATION?
586
NO
YES
580
VERIFIED?
590
NO
YES
FORWARD TO RECEIVE QUEUE
592

FIG. 5

SYSTEM AND METHOD FOR SELECTIVELY SENDING, DELIVERY AND RECEIVING OF FAXES

CROSS-REFERENCE TO RELATED APPLICATIONS

This patent application is a continuation of, and claims a benefit of priority under 35 U.S.C. § 120 from U.S. patent application Ser. No. 15/860,220, filed Jan. 2, 2018, entitled "SYSTEM AND METHOD FOR SELECTIVELY SENDING, DELIVERY AND RECEIVING OF FAXES" now U.S. Pat. No. 10,652,425, by inventor Treber Rebert, which is a continuation of, and claims a benefit of priority under 35 U.S.C. § 120 from U.S. patent application Ser. No. 14/612,969, filed Feb. 3, 2015, now U.S. Pat. No. 9,912,833, entitled "SYSTEM AND METHOD FOR SELECTIVE SENDING, DELIVERY OR RECEIVING OF FAXES THROUGH COMPUTER BASED NETWORKS BASED ON A DESTINATION ON A PUBLICLY SWITCHED TELEPHONE NETWORK" by inventor Treber Rebert, which is a continuation of, and claims a benefit of priority under 35 U.S.C. § 120 from U.S. patent application Ser. No. 13/485,140, filed May 31, 2012, now U.S. Pat. No. 8,995,025, entitled "SYSTEM AND METHOD FOR SENDING, DELIVERY AND RECEIVING OF FAXES THROUGH COMPUTER BASED NETWORKS WITH A PUBLICLY SWITCHED TELEPHONE NETWORK AS A BACKUP" by inventor Treber Rebert, which claims the benefit of priority under 35 U.S.C. 119(e) of U.S. Provisional Patent Application Ser. No. 61/501,549, filed Jun. 27, 2011, entitled "SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR PEER-TO-PEER (P2P) OPTIMAL FAX DELIVERY," by inventor Treber Rebert, the entire contents of which are hereby expressly incorporated by reference for all purposes.

TECHNICAL FIELD

This disclosure relates generally to digital content delivery in a network environment. More particularly, this disclosure relates to the transmission, delivery or reception of data through computer based networks or telephone networks. Even more specifically, this disclosure relates to the transmission, delivery or reception of faxes through computer based networks or telephone networks.

BACKGROUND

Entities such as consumers, organizations, enterprises, governments, etc. need to exchange data for a variety of reasons, as may be easily imagined. In the modern world, this data exchange is often times accomplished electronically using a variety of methodologies. These methodologies include, for example, local storage (e.g. a thumb driver holding the data which can be physically delivered to a recipient), file transfer using particular protocols (e.g. file transfer protocol (FTP)), sending an email with an attachment, facsimile (fax), etc.

While all these methods serve the same end, each of these methodologies has differing capabilities with respect to various characteristics such as ease of use, speed, security (e.g. the ability to resist interception or tampering), traceability, cost, etc. For example, using local storage may not feasible if two entities are widely dispersed geographically, while email attachments may not be secure enough to address some entities' concerns.

Faxing, while still heavily utilized by individuals and the workflows of various enterprises, may also present some difficulties. A fax comprises a document in a digital image format. The document is associated with a destination specified with respect to a publicly switched telephone network (PSTN). Thus, typically for at least a portion of the transmission, the document is transmitted over the PSTN. Faxing provides a secure, traceable and non-repudiable mechanism for content delivery and can be particularly useful in business environments.

Faxing, however, has limitations. For example, conventional fax machines can only transmit black and white files with limited resolution in a specific format such as the Tagged Image File Format (TIFF). Further, the transmission speed over the PSTN can be very slow compared to today's computer based networks. Additionally, as faxing may use the PSTN, faxing between two entities that are in different geographic area may require an expensive phone call. Accordingly, traditional faxing may be expensive as well as slow.

Thus, what is desired is a way of exchanging data in manner that is easy to use, relatively fast, secure and cost effective and yet still may be compatible with previous methods for data exchange, especially those that that may have been utilized in various workflows, such as faxing, etc.

SUMMARY

To address these needs, among others, embodiments of systems and methods for the sending, delivery and receiving of faxes are disclosed herein. In particular, systems and methods for the sending, delivery or receiving of faxes are disclosed herein. In particular, certain embodiments include a fax connector that may be deployed at users' sites, and a fax registration system that may be deployed remotely from these users' site. The fax connector can be accessed at a user's site over a computer based network in order to perform functions associated with faxing, including sending, receiving and obtaining status on faxes. The fax connector deployed at a sending user's site communicates with the fax registration system to obtain destination data associated with a recipient user's fax connector and transmits the fax to the destination fax connector over the computer based network based on the destination data obtained from the registration system. The fax can then be presented to the recipient at the recipient user's site.

Furthermore, in some embodiments, the fax may be transmitted over the publicly switched telephone network (PSTN), instead of, or in addition to, transmission over the computer based network. By transmitting over the PSTN, delivery to a recipient may still occur for example, in cases of an error occurring with respect to transmission over the computer based network, when the sender lacks authorization to send over the computer based network, when the specified destination phone number is not found, or in other instances.

Accordingly, using embodiments of the systems and methods presented herein faxing may be achieved in a manner that is easy to use, fast, secure, reliable and cost effective and yet that is still compatible with previous methods for data exchange. More specifically, because in most cases fax users already perform faxing utilizing fax servers, fax appliances, fax software, etc. connected to a computer based network (e.g. an IP (or other protocol) based network for communication between computing devices), faxing can be accomplished using embodiments of the systems and methods presented herein substantially without

deviation from the user's previous faxing methodologies or workflows. Moreover, the speed of such faxes may be increased and the cost of such faxes reduced, as they may be transmitted over the computer based network.

Additionally, security of fax transmissions may be increased by verifying fax numbers or other destination data using the registration system and encrypting at least portions of the transmissions over the computer based network. Traceability may be implemented through the use of reporting features provided by embodiments of fax connectors as disclosed herein and reliability may be achieved by utilizing the PSTN as a backup transmission mechanism.

In one embodiment, a request to send a fax may be received at a sending fax system, wherein the fax is associated with a destination on a PSTN such as a telephone number. A location on a computer based network associated with the destination on the PSTN may be determined by sending a request for the location associated with the destination on the PSTN to a fax registration system and receiving the location associated with the destination on the PSTN at the sending fax system. The fax can then be transmitted from the sending fax system to the location over the computer based network.

In some embodiments, it can be determined if an error occurred during while transmitting the fax and if an error occurred, the fax can be sent to the destination on the PSTN over the PSTN.

In other embodiments, it can be determined if the destination on the PSTN is one of a first set of registered destinations at the sending fax system, where the first set of registered destinations at the sending fax system were previously synchronized with a second set of registered destinations at the fax registration system.

In certain embodiment, the fax registration system and the location on the computer based network may be on a cloud based computing platform.

These, and other, aspects of the invention will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. The following description, while indicating various embodiments of the invention and numerous specific details thereof, is given by way of illustration and not of limitation. Many substitutions, modifications, additions or rearrangements may be made within the scope of the invention, and the invention includes all such substitutions, modifications, additions or rearrangements.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings accompanying and forming part of this specification are included to depict certain aspects of the invention. A clearer impression of the invention, and of the components and operation of systems provided with the invention, will become more readily apparent by referring to the exemplary, and therefore nonlimiting, embodiments illustrated in the drawings, wherein identical reference numerals designate the same components. Note that the features illustrated in the drawings are not necessarily drawn to scale.

FIG. **1** depicts one embodiment of an architecture for a faxing system.

FIG. **2** depicts one embodiment of an architecture for a faxing system.

FIG. **3** depicts one embodiment of an architecture for a faxing system.

FIG. **4** depicts one embodiment of an architecture for a faxing system.

FIG. **5** depicts one embodiment of a method for sending a fax.

DETAILED DESCRIPTION

The invention and the various features and advantageous details thereof are explained more fully with reference to the nonlimiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well known starting materials, processing techniques, components and equipment are omitted so as not to unnecessarily obscure the invention in detail. It should be understood, however, that the detailed description and the specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only and not by way of limitation. Various substitutions, modifications, additions and/or rearrangements within the spirit and/or scope of the underlying inventive concept will become apparent to those skilled in the art from this disclosure. Embodiments discussed herein can be implemented in suitable computer-executable instructions that may reside on a computer readable medium (e.g., a hard disk (HD)), hardware circuitry or the like, or any combination.

As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, product, article, or apparatus that comprises a list of elements is not necessarily limited only those elements but may include other elements not expressly listed or inherent to such process, product, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

Additionally, any examples or illustrations given herein are not to be regarded in any way as restrictions on, limits to, or express definitions of, any term or terms with which they are utilized. Instead, these examples or illustrations are to be regarded as being described with respect to one particular embodiment and as illustrative only. Those of ordinary skill in the art will appreciate that any term or terms with which these examples or illustrations are utilized will encompass other embodiments which may or may not be given therewith or elsewhere in the specification and all such embodiments are intended to be included within the scope of that term or terms. Language designating such nonlimiting examples and illustrations includes, but is not limited to: "for example," "for instance," "e.g.," "in one embodiment."

Embodiments of the present invention can be implemented in a computer communicatively coupled to a network (for example, the Internet, an intranet, an internet, a WAN, a LAN, a SAN, etc.), another computer, or in a standalone computer. As is known to those skilled in the art, the computer can include a central processing unit ("CPU") or processor, at least one read-only memory ("ROM"), at least one random access memory ("RAM"), at least one HD, and one or more input/output ("I/O") device(s). The I/O devices can include a keyboard, monitor, printer, electronic pointing device (for example, mouse, trackball, stylus, etc.), or the like. In embodiments of the invention, the computer has access to at least one database over the network.

ROM, RAM, and HD are computer memories for storing computer-executable instructions executable by the CPU or capable of being compiled or interpreted to be executable by the CPU. Within this disclosure, the term "computer read-

able medium" is not limited to ROM, RAM, and HD and can include any type of data storage medium that can be read by a processor. For example, a computer-readable medium may refer to a data cartridge, a data backup magnetic tape, a floppy diskette, a flash memory drive, an optical data storage drive, a CD-ROM, ROM, RAM, HD, or the like. The processes described herein may be implemented in suitable computer-executable instructions that may reside on a computer readable medium (for example, a disk, CD-ROM, a memory, etc.). Alternatively, the computer-executable instructions may be stored as software code components on a DASD array, magnetic tape, floppy diskette, optical storage device, or other appropriate computer-readable medium or storage device.

In one exemplary embodiment of the invention, the computer-executable instructions may be lines of C++, Java, JavaScript, HTML, or any other programming or scripting code. Other software/hardware/network architectures may be used. For example, the functions of the present invention may be implemented on one computer or shared among two or more computers. In one embodiment, the functions of the present invention may be distributed in the network. Communications between computers implementing embodiments of the invention can be accomplished using any electronic, optical, radio frequency signals, or other suitable methods and tools of communication in compliance with known network protocols.

Additionally, the functions of the disclosed embodiments may be implemented on one computer or shared/distributed among two or more computers in or across a network. Communications between computers implementing embodiments can be accomplished using any electronic, optical, radio frequency signals, or other suitable methods and tools of communication in compliance with known network protocols. It will be understood for purposes of this disclosure that a module is one or more computer processes, computing devices or both, configured to perform one or more functions. A module may present one or more interfaces which can be utilized to access these functions. Such interfaces include APIs, web services interfaces presented for a web services, remote procedure calls, remote method invocation, etc.

Before discussing specific embodiments, a brief overview of the context of the disclosure may be helpful. As discussed above, what is desired is a way of exchanging data in manner that is easy to use, fast, secure, reliable and cost effective and yet that is still compatible with previous methods for data exchange, especially those that that may have been utilized in various workflows, such as faxing, etc.

To that end, attention is now directed toward the embodiments of systems and methods for the sending, delivery or receiving of faxes disclosed herein. In particular, certain embodiments include a fax connector that may be deployed at users' sites, and a fax registration system that may be deployed remotely from these users' site. The fax connector can be accessed at a user's site over a computer based network in order to perform functions associated with faxing, including sending, receiving and obtaining status on faxes. The fax connector deployed at a sending user's site communicates with the fax registration system to obtain destination data associated with a recipient user's fax connector and transmits the fax to the destination fax connector over the computer based network based on the destination data obtained from the registration system. The fax can then be presented to the recipient at the recipient user's site.

Furthermore, in some embodiments, the fax may be transmitted over the PSTN, instead of, or in addition to, transmission over the computer based network. By transmitting over the PSTN, delivery to a recipient may still occur for example, in cases of an error occurring with respect to transmission over the computer based network, when the sender lacks authorization to send over the computer based network, when the specified destination phone number is not found, or in other instances.

Accordingly, using embodiments of the systems and methods presented herein, faxing may be achieved in a manner that is easy to use, fast, secure, reliable and cost effective and yet that is still compatible with previous methods for data exchange. More specifically, because in most cases fax users already perform faxing utilizing fax servers, fax appliances, fax software, etc. connected to a computer based network (e.g. an IP (or other protocol) based network for communication between computing devices), faxing can be accomplished using embodiments of the systems and methods presented herein substantially without deviation from the user's previous faxing methodologies or workflows. Moreover, the speed of such faxes may be increased and the cost of such faxes reduced, as they may be transmitted over the computer based network.

Additionally, security of fax transmissions may be increased by verifying fax numbers or other destination data using the registration system and encrypting at least portions of the transmissions over the computer based network. Traceability may be implemented through the use of reporting features provided by embodiments of fax connectors as disclosed herein and reliability may be achieved by utilizing the PSTN as a backup transmission mechanism.

Turning now to FIG. **1**, one embodiment of an architecture of just such a faxing system is depicted. Fax architecture **100** includes fax systems **140** and fax registration system **130** communicating over a computer based network ("network") **110** which may be, for example, the Internet, an internet, an intranet, a LAN, a WAN, an IP based network, etc.

Fax system **140** is installed at a site where users wish to send or receive faxes. Fax system **140** may include a fax server such as the RightFax Enterprise Edition fax server or the like. Users **102** in such an architecture **100** may be companies, individual users, or any other entity wishing to send or receive faxes. Accordingly, fax system **140** may be one or more computing devices or one or more computer processes executing on one or more computer devices utilized by such users **102** to send or receive faxes. Fax system **140** provides an interface such as an API, hardware interface, etc. through which a fax to send may be received from a client **104** of the fax system **140**. These clients **104** may include a fax machine, a printer, an enterprise resource planning (ERP) system, etc.

Fax system **140** may include one or more interfaces to PSTN **120** and be configured to send or receive faxes over the PSTN **120**. Additionally, fax system **140** includes fax connector **142** for transmitting faxes received from clients **104** over network **110** and receiving faxes transmitted over network **110**. Fax system **140** may communicate with fax registration system **130** over network **110** to facilitate transmission of these faxes.

Fax registration system **130** includes a registration module **132** and an administration module **134**. Administration module **134** is configured to provide an interface by which users who wish to receive faxes at their site may provide destination data. Such destination data may include, for example, a destination on the PSTN (e.g. a telephone number) associated with their fax system **140** or a location on network **110** associated with their fax system **140** (for

example, a universal resource locator (URL), a universal resource indicator, an internet protocol (IP) address, etc.). This destination data may be stored in registration system table **138** in data store **136**. Thus the registration system table **138** may comprise a set of registered destinations and associated destination data. Administration module **134** may also present an interface by which users of registration system **130** may obtain or view statistics on faxes sent or received at an associated fax system such as data usage, status on delivery, etc.

Registration module **132** may provide an interface by which such destination data may be obtained. More specifically, this interface may be configured such that a synchronization request may be received. In response to such a synchronization request, registration module **132** may return a list of the destinations on the PSTN associated with fax systems **140** that are stored in registration system table **138**.

The interface of registration module **132** may also be configured to receive a request for destination data associated with a particular destination on the PSTN **120**. In response to such a request for destination data, the registration module **132** may return a location on the network **110** associated with the destination on the PSTN **120** if the destination on the PSTN **120** is in registration system table **138**.

Accordingly, at various intervals (e.g. hourly, daily weekly, etc.) fax connector **142** may send a synchronization request to registration module **132** of the fax registration system **130** and receive a list of registered destinations on the PSTN **120** in response to the request. Fax connector **142** may store the received registered destinations on the PSTN **120** in connector table **148** in data store **146**.

When a user **102** in architecture **100** wishes to send a fax he may utilize a client **104** at the user's site to send the fax. Client **104** provides the fax to the fax system **140**. Fax system **140** may therefore receive a fax intended for a destination on the PSTN. The fax system **140** may check the connector table **148** to determine if the destination on the PSTN **120** associated with the received fax is a registered destination in the connector table **148**. If it is not, the fax may be transmitted to the destination over the PSTN **120**.

If, however, the destination on the PSTN **120** is a registered destination in the connector table **148**, fax connector **142** may request destination data associated with the destination on the PSTN from registration module **132** of the fax registration system **130**. In response, fax connector **142** may receive destination data associated with the destination on the PSTN **120**, including a location on network **110** associated with the destination on the PSTN **120**.

Fax connector **142** may then transmit the fax over the network **110** to that location on the network **110**. If there is an error in the transmission or the transmission is otherwise unsuccessful, the fax may be sent over the PSTN **120** to the original destination on the PSTN **120** provided by the user. If the transmission is successful, the fax connector **142** associated with the location on the network **110** may receive the fax and deliver or otherwise present the fax to a user **102**.

It will be observed by astute readers that in order to receive a fax over network **110**, the location on network **110** associated with the receiving fax system **140** may need to be a publicly accessible location on the network (e.g. not behind a firewall or the like). In many cases, however, for a variety of reasons, users **102** may be reluctant to deploy portions of their software or site publicly (e.g. outside of a firewall utilized at the user's site).

Accordingly, in some embodiments, it may be desirable to provide a location associated with the receiving fax system **140** remotely from a user's site. With that in mind, reference is now made to FIG. **2** where an embodiment of an architecture of a faxing system including a proxy receiving system is depicted. It will be noted that certain components as depicted in FIG. **2** function substantially the same as described above and thus will not be elaborated on here in more detail.

Here, architecture **200** includes fax systems **140**, fax connector **142** and proxy receiver system **250**. Proxy receiver system **250** may include proxy receiver module **252** operating as a proxy for the location on network **110** associated with fax system **140** or fax receiver **142**. The proxy receiver module **252** may include an association between each location on the network it provides and a fax connector **142**. The proxy receiver module **252** may be configured to transmit a fax or other communication received for a particular location on the network **110** to the fax connector **142** associated with that location on the network **110**.

Thus, when a user **102** in architecture **200** wishes to send a fax, he may utilize a client **104** at the user's site to send the fax. Client **104** provides the fax to the fax system **140** through the interface provided by the fax system **140**. Fax system **140** may therefore receive a fax intended for a destination on the PSTN. The fax system **140** may check the connector table **148** in the data store **146** to determine if the destination on the PSTN **120** associated with the received fax is in the connector table **148**. If it is not, the fax may be transmitted to the destination over the PSTN **120**.

If, however, the destination on the PSTN **120** is in the connector table **148**, fax connector **142** may request destination data associated with the destination on the PSTN from registration module **132** of the fax registration system **130**. In response, fax connector **142** may receive destination data associated with the destination on the PSTN **120**, where the received destination data includes the location on network **110** associated with destination on the PSTN **120**.

Fax connector **142** may then transmit the fax over the network **110** to the location on the network **110**. As the location on the network is being provided by proxy receiver module **252** the fax may be received at proxy receiver module **252**. The fax connector **142** associated with that location on the network **110** may be determined by the proxy receiver module **252** and the fax may then be forwarded from the proxy receiver module **252** to the fax connector **142** associated with the location on network **110** being provided by proxy server module **252**. Here, because the publicly available location on network **110** is being provided by proxy receiver system **250** which may be at a remote location and operated by another entity, users' security concerns may be assuaged.

While it should be understood from a review of the above description that embodiments as disclosed may be implemented using a wide variety of architectures and hardware or software systems; that a fax registration system and a proxy receiver system may be one or multiple systems that may or may not be distributed; that all of the modules (including the fax connectors, interface module, administration module, registration module and proxy receiver module) presented herein may or may not be one or multiple services (e.g. web services or the like) with one or more interfaces; and that these one or more services may be implemented and accessed in a variety of manners, it will be useful here to describe a particular embodiment in more detail.

As discussed above, in some cases it is desirable to have a registration system or a proxy receiver system remote from

a user's site. However, embodiments of the systems and methods disclosed herein may have many users and thus may entail the registration of many locations on the PSTN, a large amount of destination data, or the provisioning of a large number of locations on the network. Additionally, as users of the registration system and the proxy receiver systems may be geographically distributed it is desirable to maximize user's access to the fax registration system and the proxy receiver system to reduce downtime and allow substantially simultaneous access from multiple users to these systems.

Therefore, in one embodiment, an entity implementing embodiments of the systems and method disclosed herein may implement modules associated with a fax registration system or a proxy receiver system in a cloud based computing environment by deploying services associated with these systems using a cloud based service provider, such as Microsoft Windows Azure, Amazon EC2, vMware vCloud, Google's cloud, etc. By deploying the modules of the fax registration system or the proxy receiver system in the cloud as services, such services can utilize the storage and other functionality provided by the cloud provider while achieving increased accessibility and reliability. In addition, in certain embodiments, when a proxy receiver system is deployed in a cloud based computing environment the security of users sites is simultaneously increased by alleviating these users from the need to provide publicly available locations on a network.

With that in mind, turning now to FIG. **3**, one embodiment of an architecture of a faxing system where services associated with a fax registration system are deployed in a cloud based computing environment is depicted. Fax architecture **300** includes a network **370** over which a sending fax system **302**, a receiving fax system **362** and fax registration module **342** deployed in cloud **340** may communicate.

Fax connector **305** is provided at sending fax system **302** and may have an associated identifier (i.e. the fax connector identifier). Fax connector **305** at the sending fax system **302** may comprise fax module **306**, sync module **308** and transmitter module **310**. Fax module **306** is coupled to PSTN **320** and is configured to transmit faxes to a destination on PSTN over the PSTN **320**. Fax module **306** provides an interface through which a client of the fax connector **305** may send faxes or check the status on sent faxes. The fax module **306** is thus configured to receive a fax and an associated destination on the PSTN **320**; determine if a destination on the PSTN **320** is a registered destination in the fax number table **304**; provide a fax and a destination on the PSTN to the transmitter module **310**; receive a status from transmitter module **310** and transmit a fax to a destination on the PSTN **320**.

Sync module **308** is configured to send a request for a set of registered destinations on the PSTN; receive a set of registered destinations on the PSTN; and store a received set of registered destinations on the PSTN in fax number table **304**. Transmitter module **310** is configured to receive a fax and a destination on the PSTN; send a request for destination data associated with a destination on the PSTN; transmit a fax to a location on the network **370**; request a status; receive a status on a transmission or fax; and provide a status to fax module **306**.

Receiving fax system **362** includes fax connector **366** and may provide an external receiver module **382** that is at a location that is accessible over network **370** and which may, for example, by outside of a firewall **384**. External receiver module **382** is configured to receive requests for faxes; receive transmissions associated with faxes; provide a transmission to an associated internal receiver module **368**; receive a status or checksum; provide a status or checksum to a sending fax connector; receive a request for status; and provide a status to a sending fax connector.

Internal receiver module **368** is configured to provide the fax to transport and response module **372**; receive an acknowledgement from transport and response module **372** and respond to a request for a status. Transport and response module **372** is configured to store the fax in received faxes storage **374**; determine that the fax has been delivered; and provide an acknowledgement to internal receiver module **368**. Fax module **364** is configured to retrieve a received faxes from received faxes storage **374** and deliver a fax to a client of the receiving fax system **362** based on associated destination information.

Cloud **340** is a cloud based computing platform such as Microsoft Windows Azure Platform or the like. The faxing registration services deployed in the cloud include fax registration service **342** and an administration utility service **344**. These services may have one or more interfaces that may be accessed over network **370** using a web services interface based on hypertext transfer protocol (http), or other types of network protocols or interfaces. Other services provided by the cloud **340** (not depicted) may also be utilized (e.g. in the case of Microsoft Windows Azure Platform: Web Role, Worker Role, VM Role, Access Control, Content Delivery Network, Caching, etc. Other services in other cloud based computing platforms may also be utilized).

The cloud **340** may provide certain services that may be utilized by the deployed fax registration services, including for example the Microsoft Windows Azure Storage services such as table storage, queue storage blob storage, etc. This storage may be used during operation of the deployed service and may store various configuration information associated with the services.

The administration utility module **344** is configured to provide an interface by which a user may register a destination on the PSTN and provide destination data associated with a registered destination on the PSTN or otherwise manage an account related to fax registration service. The administration utility service **344** may store the destination data in configuration table **348** in storage **346** provided by cloud **340**.

Fax registration service **342** is configured to receive a request for destination data associated with a destination on the PSTN; respond to such a request with destination data; receive a synchronization request; and respond to the synchronization request with a set of destinations on the PSTN. As can be seen then, the fax connector **306** at the sending fax system **302**, the fax connector **366** at the receiving fax system and the fax registration service **342** deployed in the cloud may interact to send and receive faxes.

To illustrate in more detail, a user associated with a receiving fax system **362** may utilize an interface provided by administrative utility **344** to register a destination on the PSTN and provide destination data associated with the registered destination on the PSTN **320**. The destination on the PSTN may be, for example, a telephone number associated with receiving fax system **362**. The destination data supplied by the user may include a location on the network **370**, such as a URL associated with external receiver module **382**.

Additionally, in some embodiments, as it may be desired to encrypt transmissions, the user may supply a public key that is part of a public/private key pair that may be used as part of a public/private key encryption mechanism (such as,

for example, X.509 or the like). This public/private key pair may have been generated, for example, when fax connector **366** was installed at receiving fax system **362**. The destination data can then be stored in the configuration table **348**.

In one embodiment, in order to meet certain legal requirements (such as HIPAA Security Rule 164.312), or for other reasons, operators of a fax registration system may verify registered destinations on the PSTN, associated locations on the network **370** or other destination data and remove any destination on the PSTN or associated destination data that cannot be verified. This verification process may be accomplished manually or automatically, as desired.

Accordingly, as there may be many receiving fax systems, it will be noted that configuration table **348** may comprise a registered set of telephone numbers associated with a plurality of receiving fax systems, including receiving fax system **362**, where each telephone number is associated with a URL and a public key. At some time interval then, sync module **308** on sending fax system **302** may send a synchronize request to fax registration service **342**. Fax registration service **342** may return the registered set of telephone numbers in configuration table **348** to sync module **308** which stores these telephone numbers in fax number table **304**. Thus, fax number table **304** may contain the telephone numbers of each receiving fax system **362**.

In one embodiment, fax registration service **342** may encrypt the telephone numbers before responding to the synchronization request. Accordingly, in this embodiment, what is returned to sync module **308** and stored in fax number table **304** is a set of encrypted telephone numbers, such that the fax numbers stored in the fax number table **304** may not be viewed in the clear.

When a user of sending fax system **302** desires to send a fax, the fax is provided to fax module **306** along with the telephone number specifying the destination on the PSTN **320** where the user desires to send the fax. The fax may be in a digital image format such as TIFF or the portable document format (pdf) or another digital image format entirely (e.g. JPEG, Exif, RAW, PNG, CGM, SVG, etc.). When the fax module **306** receives a fax and associated telephone number the fax module may determine if the telephone number is in the fax number table **304**.

In one embodiment, the fax number table **304** may comprise encrypted telephone numbers. In this case, fax module **306** may encrypt the telephone number provided by the user using the same encryption algorithm utilized by fax registration service **342**, such that the determination whether the telephone number provided by the user is in the fax number table **304** can be made by searching for the encrypted telephone number in fax number table **304**.

If the telephone number provided by the user is not located in fax number table **304**, fax module **306** may transmit the fax to the telephone number provided by the user over the PSTN **320**. If, however, it is determined that the telephone number provided by the user is in the fax number table **304**, the fax and the telephone number may be provided to transmission module **310**. Transmission module **310** may then send a request for destination data to the fax registration service **342**, where the request specifies the telephone number provided by the user. The fax registration service **342** accesses configuration table **348** to determine the URL (and the public key if provided) associated with the telephone number received in the request and returns this destination data to the transmission module **310**. In some cases, the telephone number may not be found in the configuration table **348** or no destination data may be available. In these cases an error may be returned to the transmission module **310**.

If such an error is received by the transmission module **310**, this error may be reported to fax module **306**, which may transmit the fax to the telephone number provided by the user over the PSTN **320**. Otherwise, if destination data is received, the transmission module **310** may then transmit the fax to the URL associated with that destination data. To initiate this transmission, the transmission module **310** may send a request to initiate a transmission and the telephone number to the URL specified in the destination data. The external receiver module **382** associated with the URL may respond to this request with a token to utilize for transmission associated with the fax. Furthermore, the transmission module **310** may calculate a checksum for the fax before transmission.

In one embodiment, the transmission module **310** may separate the fax into chunks for transmission. The size of these chunks may be configurable or may be determined based on a wide variety of criteria (e.g. protocol, bandwidth availability, number of faxes being sent, size of fax, etc.) and may be static or may change dynamically during the transmission. For example, the fax may be separated into chunks of 16 kb, 32 kb, 64 kb or 128 kb for transmission. Additionally, if encryption is being utilized the chunk may be encrypted using, for example, the public/private key pair associated with the public key received from fax registration module **342**. A checksum can also be calculated by the transmission module for each chunk being transmitted. Transmission module **310** may then transmit each of these chunks to the URL received in the destination data over network **370**.

After the transmission of each chunk of the fax, the transmission module **310** may verify the status of the transmission of that chunk. In one embodiment, when a transmitted chunk is received by internal receiver module **368**, the internal receiver module may calculate the checksum for the received chunk and return the checksum to the transmission module **310**. The transmission module **310** may compare the received checksum to the checksum calculated for the chunk before the chunk was transmitted to verify the transmission of that chunk. If the transmission of a chunk cannot be verified, an action may be taken. This action may include one or more retransmissions of that chunk. Alternatively, the failure of the transmission of the chunk may be reported to fax module **306**, which may transmit the fax to the telephone number provided by the user over the PSTN **320**.

Additionally, after the last chunk has been transmitted to the location, the transmission of the entire fax may be verified as well. This verification may be accomplished by querying external receiver module **382** at regular intervals for the status of the fax. The external receiver module **382** may return the status of the fax in response to this request. If the transmission of the entire fax cannot be verified an action may be taken. This action may include one or more retransmissions of the fax. Alternatively, the failure of the transmission of the fax may be reported to fax module **306**, which may transmit the fax to the telephone number provided by the user over the PSTN **320**.

At the receiving fax system **362**, the chunks transmitted over network **370** may be received at the external receiver module **382** and sent through firewall **384** to internal receiver module **368**. In some cases, as the external receiver module **382** resides outside the firewall, internal receiver module **368** may periodically query the external receiver

module **382** and external receiver module **382** may send one or more chunks through the firewall **384** to internal receiver module **382** in response to such queries. The internal receiver module **382** may calculate a checksum for the chunk and decrypts the chunk if needed. The internal receiver module **382** may return this checksum to transmitter module **310**.

The internal receiver module **368** may thus receive all the chunks associated with a fax from the transmitter module **310**, construct the fax from these chunks and store the fax in received faxes storage **374**. In some embodiments, before the fax is stored in received fax storage **374** the internal receiver module **368** may verify the fax. To verify the fax, internal receiver module **368** may calculate the checksum for the fax and send the checksum to transmitter module **310** with a verification request. Only when a verification response is received from transmission module **310** (which may compare the original checksum of the sent fax to the checksum received in the verification request from the internal receiver module **368**) may the fax be stored in received faxes storage **374**.

The fax module **364** may periodically check the received faxes **374** storage to determine if a fax has been received. If so, the fax module **364** may obtain a received fax from received faxes storage **374** and deliver the received fax in association with the destination telephone number as configured by a user. When the fax is delivered, transport and response module **372** may send a status indicating delivery of the fax to internal receiver module **368** which in turn, sends the status to external receiver module **382**. This status may be provided to transmission module **310** in response to a request for status from transmission module **310**. It will be noted here that though the various statuses are described as being provided in a particular manner each of these statues (or others) may be sent without prompting, may be sent in response to a request for such a status, or some combination.

As discussed above, for a variety of reasons, users of fax systems may be reluctant to deploy portions of their software or site publicly (e.g. outside of a firewall utilized at the user's site). To address these users concerns, in addition to implementing services associated with a fax registration system in a cloud based computing environment an entity implementing embodiments of the systems and method disclosed herein may implement services associated with a proxy receiver system in the cloud based computing environment.

FIG. **4** depicts one embodiment of an architecture of a faxing system where services associated with both a fax registration system and a proxy receiver system are deployed in a cloud based computing environment. It will be noted that certain components as depicted in FIG. **4** function substantially the same as described above and thus will not be elaborated on here in more detail.

Here, cloud **340** includes proxy receiver module **346** configured to provide locations on the network, where each of the locations is associated with a receiving fax connector. This proxy receiver module **346** may for example, be provided by Windows Azure Service Bus or the like. Thus, proxy receiver module **346** may be configured to receive requests for faxes; receive transmissions associated with faxes; provide a transmission to an associated internal receiver module; receive a status or checksum; provide a status or checksum to a sending fax connector; receive a request for status; and provide a status to a sending fax connector.

As can be seen then, the embodiment of FIG. **4** may function similarly to FIG. **3**, however, in the case of the architecture **400** of FIG. **4**, the publicly accessible location on network **370** associated with fax connector **366** may be provided remotely from receiving fax system **362** and may be provided by an entity other than the entity which owns or controls receiving fax system **362**. Thus, many concerns about the security of implementing fax systems according to embodiments presented herein may be mitigated using embodiments such as those depicted in FIG. **4**.

Moving now to FIG. **5**, a flow diagram of one embodiment of a method for sending a fax that may be utilized embodiments of fax systems, including embodiments as presented herein. At step **510**, a user at a sending fax system may send a fax and specify a destination telephone number for the fax. At step **520**, it can be determined if the telephone number associated with the fax matches a registered number. This determination may be made by accessing a set of telephone numbers that have been registered with the system by entities which wish to receive faxes. In one embodiment, this set of telephone numbers may have been previously obtained by the sending fax system from a registration system where users who wish to receive faxes at receiving fax systems have registered telephone numbers associated with those receiving fax systems. If the telephone number specified by the user at the sending fax system in association with a fax does not match a previously registered telephone number the fax may be transmitted to the destination telephone number over the PSTN at step **530**.

At step **540**, it can be determined if any transmissions over a computer based network to a location associated with the destination telephone number have previously failed. This information may be recorded in association with the telephone number at the sending fax system. If over a number (e.g. one or more) transmissions to the telephone number have previously failed, the fax may be transmitted to the destination telephone number over the PSTN at step **530**. It will be noted the number of failed transmission may be configurable.

Otherwise, at step **550**, a location on the computer based network associated with the destination telephone number may be determined. This determination may be made by accessing a registration system to determine destination data associated with the telephone number. In one embodiment, this destination data may have been obtained from a registration system where users who wish to receive faxes at receiving fax systems have specified destination data associated with the telephone numbers for the receiving systems. This destination data may include a URL associated with the telephone number for the receiving system.

A fax checksum can be determined for the fax at step **560** and a request to initiate a fax transmission over the computer based network can be sent to the URL at step **570**. The fax can then be transmitted at step **580**. More specifically, the fax may be transmitted as a set of chunks. For each of the set of chunks, a chunk checksum may be calculated for the chunk at the sending fax system and the chunk may be transmitted to the URL at step **582**. The transmission of the chunk can then be verified. The chunk may be received at step **584** and the chunk checksum of the received chunk determined at the receiving fax system and returned to the sending fax system. The chunk checksum received at the sending fax system can then be compared to the originally calculated chunk checksum to verify the chunk at step **586**. If the chunk checksums are not the same, the fax may be transmitted to the destination telephone number over the PSTN at step **530**. A failed transmission may then be recorded in association with the destination telephone num-

ber. If the chunk checksums are the same, the next chunk may be transmitted to the location at step **582**.

When the last chunk of the fax is verified at step **584**, the fax can then be verified at step **590**. In one embodiment, the receiving fax system may construct the fax from the chunks received from the sending fax system and calculate a fax checksum for the fax. The fax checksum for the fax may be sent to the sending fax system. The sending fax system may compare this fax checksum to the fax checksum calculated for the fax by the sending fax system. If the fax checksums match the sending fax system may send a verification to the receiving fax system. If the fax checksums do not match the fax may be transmitted to the destination telephone number over the PSTN at step **530**. A failed transmission may then be recorded in association with the destination telephone number. If a verification is received at the receiving fax system, the receiving fax system may place the fax on the received queue at step **592** for delivery.

As can be seen then, using embodiments of the systems and methods disclosed herein, a user can use their familiar fax environment without the restrictions of using a browser and without the need to maintain local hardware, licenses, or telephone lines. Accordingly, using embodiments of the systems and methods presented herein faxing may be achieved in a manner that is easy to use, fast, secure, reliable and cost effective and yet that is still compatible with previous methods for data exchange.

Additionally, security of fax transmissions may be increased by verifying the fax numbers and other destination data using the registration system and encrypting at least portions of the transmissions over the computer based network; traceability may be implemented through the use of a reporting features provided by embodiments of fax connectors as disclosed herein; and reliability may be achieved by utilizing the PSTN as a backup transmission mechanism.

Although the invention has been described with respect to specific embodiments thereof, these embodiments are merely illustrative, and not restrictive of the invention. The description herein of illustrated embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise forms disclosed herein (and in particular, the inclusion of any particular embodiment, feature or function is not intended to limit the scope of the invention to such embodiment, feature or function). Rather, the description is intended to describe illustrative embodiments, features and functions in order to provide a person of ordinary skill in the art context to understand the invention without limiting the invention to any particularly described embodiment, feature or function. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes only, various equivalent modifications are possible within the spirit and scope of the invention, as those skilled in the relevant art will recognize and appreciate. As indicated, these modifications may be made to the invention in light of the foregoing description of illustrated embodiments of the invention and are to be included within the spirit and scope of the invention. Thus, while the invention has been described herein with reference to particular embodiments thereof, a latitude of modification, various changes and substitutions are intended in the foregoing disclosures, and it will be appreciated that in some instances some features of embodiments of the invention will be employed without a corresponding use of other features without departing from the scope and spirit of the invention as set forth. Therefore, many modifications may be made to adapt a particular situation or material to the essential scope and spirit of the invention.

Reference throughout this specification to "one embodiment," "an embodiment," or "a specific embodiment" or similar terminology means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment and may not necessarily be present in all embodiments. Thus, respective appearances of the phrases "in one embodiment," "in an embodiment," or "in a specific embodiment" or similar terminology in various places throughout this specification are not necessarily referring to the same embodiment. Furthermore, the particular features, structures, or characteristics of any particular embodiment may be combined in any suitable manner with one or more other embodiments. It is to be understood that other variations and modifications of the embodiments described and illustrated herein are possible in light of the teachings herein and are to be considered as part of the spirit and scope of the invention.

In the description herein, numerous specific details are provided, such as examples of components and/or methods, to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that an embodiment may be able to be practiced without one or more of the specific details, or with other apparatus, systems, assemblies, methods, components, materials, parts, and/or the like. In other instances, well-known structures, components, systems, materials, or operations are not specifically shown or described in detail to avoid obscuring aspects of embodiments of the invention. While the invention may be illustrated by using a particular embodiment, this is not and does not limit the invention to any particular embodiment and a person of ordinary skill in the art will recognize that additional embodiments are readily understandable and are a part of this invention.

Any suitable programming language can be used to implement the routines, methods or programs of embodiments of the invention described herein, including C, C++, Java, assembly language, etc. Different programming techniques can be employed such as procedural or object oriented. Any particular routine can execute on a single computer processing device or multiple computer processing devices, a single computer processor or multiple computer processors. Data may be stored in a single storage medium or distributed through multiple storage mediums, and may reside in a single database or multiple databases (or other data storage techniques). Although the steps, operations, or computations may be presented in a specific order, this order may be changed in different embodiments. In some embodiments, to the extent multiple steps are shown as sequential in this specification, some combination of such steps in alternative embodiments may be performed at the same time. The sequence of operations described herein can be interrupted, suspended, or otherwise controlled by another process, such as an operating system, kernel, etc. The routines can operate in an operating system environment or as stand-alone routines. Functions, routines, methods, steps and operations described herein can be performed in hardware, software, firmware or any combination thereof.

Embodiments described herein can be implemented in the form of control logic in software or hardware or a combination of both. The control logic may be stored in an information storage medium, such as a computer-readable medium, as a plurality of instructions adapted to direct an information processing device to perform a set of steps disclosed in the various embodiments. Based on the disclo-

sure and teachings provided herein, a person of ordinary skill in the art will appreciate other ways and/or methods to implement the invention.

It is also within the spirit and scope of the invention to implement in software programming or of the steps, operations, methods, routines or portions thereof described herein, where such software programming or code can be stored in a computer-readable medium and can be operated on by a processor to permit a computer to perform any of the steps, operations, methods, routines or portions thereof described herein. The invention may be implemented by using software programming or code in one or more general purpose digital computers, by using application specific integrated circuits, programmable logic devices, field programmable gate arrays, optical, chemical, biological, quantum or nano-engineered systems, components and mechanisms may be used. In general, the functions of the invention can be achieved by any means as is known in the art. For example, distributed, or networked systems, components and circuits can be used. In another example, communication or transfer (or otherwise moving from one place to another) of data may be wired, wireless, or by any other means.

A "computer-readable medium" may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, system or device. The computer readable medium can be, by way of example, only but not by limitation, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, system, device, propagation medium, or computer memory. Such computer-readable medium shall generally be machine readable and include software programming or code that can be human readable (e.g., source code) or machine readable (e.g., object code).

A "processor" includes any, hardware system, mechanism or component that processes data, signals or other information. A processor can include a system with a general-purpose central processing unit, multiple processing units, dedicated circuitry for achieving functionality, or other systems. Processing need not be limited to a geographic location, or have temporal limitations. For example, a processor can perform its functions in "real-time," "offline," in a "batch mode," etc. Portions of processing can be performed at different times and at different locations, by different (or the same) processing systems.

It will also be appreciated that one or more of the elements depicted in the drawings/figures can also be implemented in a more separated or integrated manner, or even removed or rendered as inoperable in certain cases, as is useful in accordance with a particular application. Additionally, any signal arrows in the drawings/figures should be considered only as exemplary, and not limiting, unless otherwise specifically noted.

Furthermore, the term "or" as used herein is generally intended to mean "and/or" unless otherwise indicated. As used herein, a term preceded by "a" or "an" (and "the" when antecedent basis is "a" or "an") includes both singular and plural of such term (i.e., that the reference "a" or "an" clearly indicates only the singular or only the plural). Also, as used in the description herein, the meaning of "in" includes "in" and "on" unless the context clearly dictates otherwise.

Benefits, other advantages, and solutions to problems have been described above with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any component(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential feature or component.

What is claimed is:

1. A system for faxing, comprising:

a fax registration system coupled to a plurality of remote fax systems over a computer network, the fax registration system including:

a registration system table comprising destination data including a registered destination associated with a remote fax system, the registered destination data associated with a destination on a publicly switched telephone network (PSTN); and

a registration interface for obtaining destination data stored in the registration system table,

wherein each remote fax system is deployed at a location remote from the fax registration system and is adapted to:

receive destination data from the fax registration system,

store destination data in a connector table at the remote fax system,

receive a request to send a fax from a client device at the remote location, wherein the fax is associated with a first destination on a publicly switched telephone network (PSTN),

access the connector table at the remote fax system to determine if the first destination associated with the fax is registered in the connector table,

transmit the fax to the first destination over the PSTN when the first destination associated with the fax is not registered in the connector table at the remote fax system, and

when the first destination associated with the fax is registered in the connector table:

request a second destination associated with the first destination from the fax registration system through the registration interface of the fax registration system,

receive the second destination from the fax registration system, and

transmit the fax over the computer network to the second destination.

2. The system of claim **1**, wherein the fax registration system is deployed in a cloud based computing environment.

3. The system of claim **1**, wherein the second location is associated with a proxy receiver system.

4. The system of claim **3**, wherein the proxy receiver system is deployed in a cloud based computing environment.

5. The system of claim **3**, wherein at the proxy receiver system, a third location on the computer network associated with the first destination on the PSTN is determined and the fax is transmitted from the proxy receiver system to the third location over the computer network.

6. The system of claim **1**, wherein the remote fax system is adapted for determining if an error occurred while transmitting the fax over the computer network to the second destination and if an error occurred, sending the fax to the first destination on the PSTN over the PSTN.

7. A method for faxing, comprising:

providing a fax registration system coupled to a plurality of remote fax systems over a computer network, the fax registration system:

providing a registration system table comprising destination data including a registered destination associated

with a remote fax system, the registered destination data associated with a destination on a publicly switched telephone network (PSTN); and

providing a registration interface for obtaining destination data stored in the registration system table,

wherein each remote fax system is deployed at a location remote from the fax registration system and is adapted to:

receive destination data from the fax registration system,

store destination data in a connector table at the remote fax system,

receive a request to send a fax from a client device at the remote location, wherein the fax is associated with a first destination on a publicly switched telephone network (PSTN),

access the connector table at the remote fax system to determine if the first destination associated with the fax is registered in the connector table,

transmit the fax to the first destination over the PSTN when the first destination associated with the fax is not registered in the connector table at the remote fax system, and

when the first destination associated with the fax is registered in the connector table:

request a second destination associated with the first destination from the fax registration system through the registration interface of the fax registration system,

receive the second destination from the fax registration system, and

transmit the fax over the computer network to the second destination.

8. The method of claim **7**, wherein the fax registration system is deployed in a cloud based computing environment.

9. The method of claim **7**, wherein the second location is associated with a proxy receiver system.

10. The method of claim **9**, wherein the proxy receiver system is deployed in a cloud based computing environment.

11. The method of claim **9**, wherein at the proxy receiver system, a third location on the computer network associated with the first destination on the PSTN is determined and the fax is transmitted from the proxy receiver system to the third location over the computer network.

12. The method of claim **7**, wherein the remote fax system is adapted for determining if an error occurred while transmitting the fax over the computer network to the second destination and if an error occurred, sending the fax to the first destination on the PSTN over the PSTN.

13. A non-transitory computer readable medium, comprising instructions for:

at a fax registration system coupled to a plurality of remote fax systems over a computer network, the fax registration system:

providing a registration system table comprising destination data including a registered destination associated with a remote fax system, the registered destination data associated with a destination on a publicly switched telephone network (PSTN); and

providing a registration interface for obtaining destination data stored in the registration system table,

wherein each remote fax system is deployed at a location remote from the fax registration system and is adapted to:

receive destination data from the fax registration system,

store destination data in a connector table at the remote fax system,

receive a request to send a fax from a client device at the remote location, wherein the fax is associated with a first destination on a publicly switched telephone network (PSTN),

access the connector table at the remote fax system to determine if the first destination associated with the fax is registered in the connector table,

transmit the fax to the first destination over the PSTN when the first destination associated with the fax is not registered in the connector table at the remote fax system, and

when the first destination associated with the fax is registered in the connector table:

request a second destination associated with the first destination from the fax registration system through the registration interface of the fax registration system,

receive the second destination from the fax registration system, and

transmit the fax over the computer network to the second destination.

14. The non-transitory computer readable medium of claim **13**, wherein the fax registration system is deployed in a cloud based computing environment.

15. The non-transitory computer readable medium of claim **13**, wherein the second location is associated with a proxy receiver system.

16. The non-transitory computer readable medium of claim **15**, wherein the proxy receiver system is deployed in a cloud based computing environment.

17. The non-transitory computer readable medium of claim **15**, wherein at the proxy receiver system, a third location on the computer network associated with the first destination on the PSTN is determined and the fax is transmitted from the proxy receiver system to the third location over the computer network.

18. The non-transitory computer readable medium of claim **13**, wherein the remote fax system is adapted for determining if an error occurred while transmitting the fax over the computer network to the second destination and if an error occurred, sending the fax to the first destination on the PSTN over the PSTN.

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